10

OUTLINE

OF

A COMPREHENSIVE PLAN

FOR

ERTING THE SEWAGE OF LONDON AND WESTMINSTER FROM THE THAMES AND APPLYING IT TO AGRICULTURAL PURPOSES,—FOR IMPROVING THE NAVIGATION OF THE RIVER,—AND FOR ESTABLISHING A SUPPLY OF PURE WATER TO THE METROPOLIS.

BY JOHN MARTIN, K. L.

PROJECTOR OF THE METROPOLITAN SEWAGE MANURE COMPANY.

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NOTE.—The Plan described in the accompanying pamphlet is revised in accordance with the levels officially supplied last autumn; it has not, however, been laid before the Commissioners of Sewers, but I have duly apprised them of my readiness to submit it, in detail, as the plan forwarded in August last was prepared without the advantage of the data subsequently furnished.

Since the publication of my pamphlet the Commissioners have brought up a Report upon all the Plans received prior to December 15, 1849; and though it is intimated that the Report is not conclusive as regards the decision upon the general question, still the tenor of the document so manifestly indicates a fixed intention to maintain and confirm the discharge of the sewage into the Thames, that it behoves all who are interested in Sanitary Improvement to combine in protesting against *any measures* of which the pollution of the river is a fundamental principle; and against the irrecoverable wasting of a large property so valuable as the sewage would be if distributed over the soil.

As an individual I humbly enter my protest on public grounds; but I likewise protest on the special part of the Metropolitan Sewage Manure Company, in which, as the Projector I hold so large a stake, against *any proposal* that shall contravene their Act, as explained in the Preamble.

"Whereas it is expedient and desirable to preserve and render available for agricultural purposes the drainage that now falls into the river Thames from the public Sewers of London, Westminster, and the vicinity, and thereby greatly add to the produce of the country."

"And whereas the above object will be best effected by executing the works necessary to carry out the same in *successive portions or sections.*"

"And whereas the several persons hereinafter named, together with other persons, are willing and desirous to carry out the said objects, limiting their first operations in the first instance to the King's Scholars' Pond Sewer and the Ranelagh Sewer. May it therefore," &c. &c. &c.

Or that shall render futile the Resolution passed at the Court of Sewers, March 1st of the present year.

"That the Court regards with satisfaction the efforts made by the Sewage Manure Company to distribute the Sewage Water and Manure, and thereby remove from the Thames, where it is noxious, matter which spread over the land is found to be most beneficial and fertilizing."

"The Court will afford to the Company, and to all parties engaged in effecting this useful object, every facility and encouragement consistent with the important interests confided to the care of the Commission."

JOHN MARTIN.

PREFACE.

The following pages contain, as the title indicates, merely an "outline" of the series of plans, which I have prepared with a view to aid in carrying forward that improved system of sanitary regulations, which has lately occupied so large a share of public attention. The plans, which I have in view, are the result of a long and patient study of the great question of Drainage and Water Supply as applied to the Metropolis; and I am now fully prepared to prove their practicability and to carry them into effect, if I am favored with that degree of support from the Government and from the Public at large, which the vast importance of the proposed improvement urgently demands.

Much as I desire to obtain the sanction and support of public opinion, I should have preferred to submit my plans, in the first instance, solely to the Commissioners of Sewers, rather than have had recourse to the present brief and necessarily imperfect publication, were I not anxious *to establish my claim to originality of design*, which just now bids fair to be quite smothered by a host of newly created competitors. If the information which I have received be correct, it is a positive fact that, out of the whole of the plans (upwards of 160) which have recently been submitted to the Commissioners of Sewers, there is not one with any pretension to feasibility, which is not, either wholly or in part, a plagiarism from some one or other of my published plans. This is no mere supposition of my own; for Sir Henry De La Beche distinctly stated, at a late meeting of the Commissioners of Sewers, that *my suggestions could alone lay claim to originality of design*. In proof of the justice of this claim, I may perhaps be allowed to observe, that, so far back as the year 1828, I published " A Plan for supplying the cities of London and Westminster with Pure Water, together with the details of a Proposition for securing the Thames from the admission of Sewage, and rendering it available for Manure." It is clear, therefore, that I, at all events, am no new competitor in the field of invention.

From the date of the above publication until the present time (now well nigh 22 years) I have devoted my attention to the important questions of Drainage and Water Supply. As a portion of my general plan, I projected, and carried to a successful issue, the formation in 1846 of " the METROPOLITAN SEWAGE MANURE COMPANY," which had secured to it by Act of Parliament the Sewage of an important district of the Metropolis,—a Company, which, although hitherto almost ruined by bad management, may yet, by a timely application of the pruning knife of reform, become useful to the public at large, and profitable to the Shareholders. If ever there was a time, when such a Company might hope to prosper, or when the originator of such a Plan as that set forth in the following pages might reasonably hope for success, that time is now present. Public opinion (long sluggish, if not entirely dormant) is at length thoroughly aroused upon the question of sanitory reform; and it is quite certain, that some comprehensive scheme of Metropolitan Drainage and Water Supply *must* soon be adopted. Having so long " borne the burden and heat of the day," I venture to hope that my matured plans may receive both from the Government and the Public that support and encouragement, which in this noble country is rarely witheld from inventive skill, and which certainly should not be witheld from inventive skill, which aims at the general good.

JOHN MARTIN.

LINDSEY HOUSE, CHELSEA,
March 11*th*, 1850.

OUTLINE OF A PLAN

FOR

IMPROVED METROPOLITAN DRAINAGE AND WATER SUPPLY.

BEFORE I enter upon a detail of my proposed Plan, or rather series of Plans, I beg to state that I have been professionally assisted in the preparation of it by MR. W. SOWERBY, Jun, A.C.E. and also by MR. J. H. JONES, C. E.; and I desire thus publicly to record the obligation, which I am under to each of them.

1. SEWERAGE.

IT is proposed to divide the Metropolis into convenient drainage districts, and to divert the whole of the sewage from the river, at the lowest outfalls, by means of a series of intercepting Sewers adapted to the various districts, instead of the long continuous Sewers originally suggested; as thus any required amount of fall can be obtained without increasing unnecessarily the depth of the Sewer; and all local difficulties, such as dock entrances, blocks of public or private buildings, &c. can be avoided.

The first district should comprise the diversion of the Ranelagh Sewer to the *present station of the Metropolitan Sewage Manure Company*, where the drainage of Brompton, Walham Green, and Fulham should, likewise, concentre,—provision being made to let off the superfluous flood waters of the Ranelagh Sewer, by means of the King's Scholar's Pond Sewer. For the second district, the King's Scholar's Pond Sewer is proposed to be taken up in the Green Park, and carried thence by a direct line to the river at a point a little above Vauxhall Bridge, intercepting all the drainage of the lower levels of Westminster in its course; continuing across the Thames to South Lambeth, where the levels show that a point of discharge can be obtained as effective as at Greenwich which is seven miles lower down the river;—thus securing for the Westminster drainage the means of lowest outfall and of self-acting discharge under emergency. For the central district, the drainage discharging between Westminster and Waterloo Bridges is proposed to be intercepted by a Sewer, with a station in the recovered ground near Hungerford Market, for diverting the sewage to the nearest main road. For the city district, the sewer is proposed to be continued from Waterloo Bridge, along the side of the Thames, intercepting all the sewers at their lowest outfalls, until it reaches Whitefriars or Puddle Dock, where it is proposed to have the next station for diverting the sewage; the line of Sewer to be continued from the station to a terminus at Irongate Stairs. The drainage of the Tower Hamlet district to be intercepted and carried down to a station in some recovered ground at Shadwell. For the Surrey side of the river, the drainage of Lambeth, Brixton, Camberwell, &c. to concentre at the Westminster drainage terminus at South Lambeth; and the drainage of Rotherhithe, Hatcham, &c. to unite at a station near Deptford Creek. Thus the whole sewerage of the urban districts will be effectually intercepted by means of these main Sewers, the longest of which would not exceed two miles in length. A station with pump engines is proposed to be placed at the termination of each line of intercepting Sewer, and immediately adjacent to a tidal portion of the river, to facilitate the discharge of extraordinary flood waters, though the pumps and silt wells will be so arranged that no sewage need be wasted, whilst the run of the Sewers will always be maintained. It is not proposed to interfere with the existing system of sewerage excepting in the Westminster and Kent and Surrey districts, and by making the Sewers more efficient where requisite.

In order to relieve the drains of the lower parts of the town the house drainage of the various suburban districts of the surrounding higher levels, should be directed to stations in the line of receiving main to be hereafter described. The surface drainage in these high levels to be separated from the house drainage, so that nothing impure may enter the higher parts of the river or its tributaries; the surface drainage within the town, however, to run into the sewers, as it is too mixed with impurities to be allowed to pollute the natural streams. This system combined with filter tube drainage of lands, and careful protection of earthy banks of springs and rivulets from washing up, will effectually prevent any impurity ever entering the sources whence the supplies of water are to be derived.

2. SEWAGE DISTRIBUTION.

It is proposed to convey the sewage into the country, and to distribute it over the soil by a series of pipes and pumping apparatus. In dry seasons the tidal water could be used either for diluting the sewage, or for watering the land; and by a further application of the same system, sea water could be supplied inland for baths, and for agricultural purposes. The arrangement of the pipes to be as follows:—To strike a circle round London; of a radius of five miles, and upon convenient elevations near the range of the circle, to place the first country sewage depôts at distances of about five miles apart, mains are to lead from the central town stations *direct* to these depôts, which should likewise be connected with one another by a main laid from depôt to depôt, with a water and sewage receptacle at every station, constituting in effect a continuous chain of elevated reservoirs round the whole metropolitan district. The service pipes are to issue from the distributing main in parallel lines half a mile apart, with taps disposed at angles of 60°, to which gutta percha hose could be attached for distributing the fluid over the soil. The sewage mains or radii should be continued in direct lines to the upland country, the bands of distributing main intersecting them at intervals of six miles *(see diagrams)*; each point of intersection having a reserve depôt, from which either water, sewage, or both mixed, could be directed right or left at pleasure. The surrounding mains are proposed to be driven from low points of the river towards the uplands, the first and second bands taking up tidal water; and the third, sea water; and by extending the bands yet farther an unlimited supply of fluid manure could be afforded without depriving the upper part of the Thames or other natural streams of their waters. The surrounding bands would also, facilitate the diverting of the sewage of country towns, the drainage being directed to the pump well of the nearest sewage station upon the line of main. Hills instead of obstacles to the system would be most advantageous, since by pumping to reservoirs upon their summits, all the surrounding valleys will be commanded, and ample room for such reserves will be found in remote country districts where the manure is of most value.

3. WATER SUPPLY.

The river being relieved of all sewage, it is next proposed to separate the tidal water and pollution attending the shipping and constant traffic in so great a port, from the upper portion of the stream, and to afford thence an uninterrupted and inexhaustible supply of pure water to every part of the Metropolis—to improve the banks of the river—to maintain the stream sufficiently deep to be at all times navigable close to the quays, and to form convenient landing places.

In order to effect these objects a Weir is proposed to be constructed at London Bridge; by which means the whole of the upper part of the stream and its tributaries would be retained as inexhaustible reservoirs of bright running water, fit for every domestic purpose. The foundation and piers of the present bridge are proposed to be taken advantage of to form part of the foundation of the proposed Weir; the stairs and landing places of the bridge would work commodiously without additional approaches being necessary; and the Weir would besides protect the foundations of the bridge, as well also as the foundations of the other bridges higher up the river, and assist to prevent farther settling. The top of the Weir is proposed to be constructed so as to afford a broad landing platform at each side of the river, both above and below the bridge,—that below, rising and falling with the tide, but that above being a solid fixture, with sufficient spaces left to allow the water to flow underneath, so that the platform will extend under the end arches of the bridge like a firm dry flooring, with ample spaces for landing communicatting directly with the bridge stairs. The Weir to be as high as the highest tide known, but backed to the level of Trinity high water mark; the centre arch to be made with one large lock, and the one on each side adjoining the centre arch, to have two smaller locks in each. As regards the water supply, *the river and its tributaries being thus rendered continuous reservoirs*, the supply could be taken up at any point; it is, therefore, proposed to use the present engines of the West Middlesex Water Works, and on the south side of the river to use the engines of the Southwark Water Works, for lifting the water; and to adopt a similar system for water supply to that described for distributing the sewage—*i. e.* to lay a main direct to the high lands near Hampstead on the north, and near Norwood on the south; thence descending towards the east, filling the existing mains and collateral branches in their course, and affording a constant and efficient high pressure supply even to the attic stories of all the houses by means of the encompassing main.

To preserve a constantly changing supply of running water to the Tower, St. Catherine, and London Docks, the tidal water should be entirely excluded, and a main laid from that part of the river immediately above the Weir direct to the docks, and as nothing but pure water could enter, the expense of cleansing the docks would thus be saved. In addition to this the banks of the river are proposed to be raised where requisite, and lined with slate planking; recess docks removed; and all marshy, and ill drained lands bordering on the river improved by procuring the discharge of their superabundant waters into lower outfalls (*see plans*).

4. TIDAL CHANNEL.

In order effectually to accomplish all the above objects, of procuring a lower outfall for the drainage, entire diversion of the sewage from the Thames, and separation of every species of pollution from its waters; as well as to remove any objections that may be raised on the score of interrupting the traffic on the river—it is proposed to extend and improve the Grand Surrey Canal, by converting it into a tidal channel: thus—to commence the channel at a point in the river Thames near Deptford Dock Yard; thence in a regular serpentine direction following the ancient bed of the river, making use of the existing canal and works, so far as expedient and possible, and reclaiming such parts as are not so taken, to a point above Vauxhall Bridge. It is farther proposed to extend this channel right on to Wandsworth, where the river Wandle would be diverted from the Thames to flow henceforth in the new channel: from Wandsworth the line could proceed to Barnes, Mortlake and Richmond; thence by a culvert under the Thames, and by a straight course up to Staines, or even Datchett. Locks are to be placed at the before named places, to enable vessels to enter the main stream, and like wise to allow a portion of the pure water of the river to enter the channel when the tide is low, so as to preserve a wholesome current at all times, and to let off extraordinary flood waters. It is not proposed to lock the channel at the lower end, but to afford to the trade upon it all the advantages of a tidal river. By means of this new channel the required improvement of the drainage of the Westminster, Surrey and Kent districts would be efficiently secured, as it affords a lower natural outfall without involving great lengths of sewer: a lower outfall for the whole drainage of the low levels between Greenwich and Staines, would also be given—a beautiful stream of running water would be obtained—passing for a considerable distance through a densely populated district, where the accommodation of water communication would increase the facilities of commerce.

This plan will likewise relieve the upper part of the river of much objectionable traffic by abridging the distance between Staines and Greenwich one half, that is from 40 to 20 miles, diminishing the length of the voyage from two days to less than one; the tidal action will be sent 20 miles higher up the river, with two locks instead of seven, and the river itself being backed to high water-mark these locks will not require to be high: the navigation will never be interrupted, as at the same time that the trade is carried inland by the tide in the channel, the outward bound can descend by the main stream, and vice versa; and it would moreover greatly augment the value and sanitary condition of the adjoining property, and of the entire district through which it passed, which would be yet farther improved by forming promenades with plantations of trees upon its banks, where vacant space would allow.

By the above means a great portion of the ancient channel of the river would be made to resume its old purpose, and by forming the new works of sufficient depth, with secure cuttings and banks, the healthful drainage of the district would be permanently secured, and the channel appear, and actually be, like a natural running and tidal river; whilst the Thames itself would realize the descriptions of our poets—

> "Though deep yet clear, though gentle yet not dull;
> Strong without rage, without o'erflowing full;"

then truly—

> " free as seas or wind,
> Unbounded Thames shall flow for all mankind,
> Whole nations enter with each swelling tide,
> And seas but join the regions they divide;
> Earth's distant ends our glory shall behold,
> And the new world launch forth to seek the old."

GAS.

Among the principal nuisances in the Metropolis are the Gas Manufactories, which are generally situated in densely populated neighbourhoods. It is, therefore, suggested to incorporate the whole of the numerous gas works now within and around London, into two grand stations, one on each side of the river, as low down as Barking Creek on the left banks, and between Greenwich and Woolwich on the right, leaving the existing gas-holders in their present situations, these low points being convenient for the landing of the coal; saving the colliers employed in supplying the gas works from 12 to 20 miles of sailing; and thereby removing both a noxious manufacture and the accompanying objectionable trade to a thinly peopled locality distant from London. All chymical works, bone boiling and crushing operations, potteries, furnaces, and trades which constitute in themselves pernicious nuisances should be carried on in the neighbourhood of the gas manufactories, as by simplifying and concentring all the objectionable trades at this one point, remote from town and at a low part of the river, no foul refuse could ever pollute the stream above the tidal action, and the sanitary condition of the thickly peopled Metropolis would be improved.

It is, however, to be imperatively urged, that every nuisance belonging to such works, should be as strictly prevented as if they were within the town, for desirable as it may be to improve the sanitary state of the town, it must not be done at any avoidable sacrifice of that of the country. In existing manufacturing localities, all nuisance from smoke and foul refuse could be effectually prevented; thus—instead of the numerous and costly chimnies of the present system the smoke of each factory could be conducted into one common flue discharging into a single chimney, like a campanile, and there disinfected and destroyed by the means proposed by Mr. Sowerby, in his system for ventilating Sewers; the flue serving also to ventilate all the premises communicating with it. The sewage of all the factories should likewise be intercepted by one common Sewer, and this combination of arrangements would facilitate the economic supply of hot and cold water to the separate works—such situations as Barking Creek and the banks of the tidal channel offering peculiar advantages for the working of the system.

Desirable as it may be to consolidate the management of the whole Sanitary Regulations of the Metropolis, it is still more essential to lay down a comprehensive system upon which the various improvements should be carried out. It was with this view that my Metropolis Improvement Plan was originally promulgated, and though the practicability of effecting any one of the objects either in part or wholly was strongly impressed, I never failed to urge that the portion so taken should be *in conformity with the general plan,* so that at any time it might be carried farther. The present description contains many alterations and important additions to my former general plan; the alterations being, the placing the Weir at London Bridge, and abandonment of the water wheels, as the interruption to trade would be of greater consequence than their value as a motive power; and the economic arrangement of the mains for conveying, collecting, and distributing the sewage: whilst the additions comprise the formation of the new tidal channel and the removal of the gas and other offensive manufactories. For the rest, the principles I have so long urged, remain the same, and I can but repeat my former arguments for carrying them into effect. As regards the general objects, it is indisputable that efficient drainage is dependant on plentiful supplies of water; and that we have not only to meet the requirements of the present time, but to provide for the future population, a subject of serious moment when we reflect on the present rate of increase, for in a country where there die annually many who have attained 100 years, it is not too much to assert that the child is already born amongst us who will live to see 10,000,000 of people in our Metropolis. Careful investigation has proved that there is no permanent source sufficiently ample except the Thames, and at a point so low as to catch the whole run of its chief tributaries. There being then no alternative, the sole question is, how to render the water pure; for revolting as may be its state now, when but two thirds of the populous districts drain into it, little reflection is necessary to conceive what it will become when the expressed intentions of the Sewers Commissioners are carried out, and the whole drainage of the Metropolitan districts is discharged into it; and what, yet again, as the population increases? It is then our solemn duty boldly to face the evil, and to provide according to the great necessities of the increasing population—to grasp at some broad comprehensive measure, and not to be scared by its cost, or by considerations of return. Ample direct returns, however, can be shown from the foregoing plans; but the direct returns are as nothing compared with the advantages that would accrue from the permanent employment created for the people;—the consequent diminution of the poor's rates;—and the augmentation of agricultural produce.

The following Estimates showing the cost of each separate part of the Plan, have been furnished by my professional coadjutors, Messrs. Wm. Sowerby, Jun. and J. Hodgson Jones.

ESTIMATES.

SEWAGE, &c.

Stations, Pumping Engines, &c.	162,200	
New Sewers, &c.	61,060	
21¼ miles of Piping	92,400	
30 miles Connecting Band	132,000	
Six large Depôts	180,000	
Contingencies	22,326	£649,986
Weir at London Bridge, with Locks to the three middle Arches		£198,000

For Sewer Water distribution over 828 square miles upon the proposed System.

One Band, 66 miles	290,400	
Direct Main, 36 miles	158,400	
Six Depôts	180,000	
Service Pipes, 1500 miles	200,000	
Taps	46,000	
	874,800	
10 per Cent	87,480	962,280
The next Band would distribute the Sewer Water over 750 square miles; expense of extension would be		£1,107,920

WATER SUPPLY.

Additional Engine Power	50,000	
New Mains, &c.	92,400	
Connections	10,000	
Contingencies	15,240	£167,640

Gas Works removal, &c.	£500,000

Canal Cuttings	£155,466	
Locks	75,000	
Land	54,000	
Bridges	30,000	
Towing Path	12,000	
Fencing	720	
	327,186	
10 per cent. contingencies...	32,718	£359,904

The time required for the completion of the whole of the above works, if commenced simultaneously, would be about 18 months.

By dividing the total amount of cost into several Sewage Manure Companies, a moderate capital only would be required for each; whilst it would seem but just that the Metropolis, which benefits by the diversion of the sewage, should bear the expense of the intercepting sewers, and arrangements for conveying it to the first band,—namely, £649,986.

It has been suggested to me, that my plans are too comprehensive for the public mind, and too costly for the public purse, collapsed as it is by recent Railway ruin. I entertain a widely different opinion. The public mind which could comprehend, and the public purse which could pay for, the existing system of Railway communication, will surely be able to comprehend and to pay for the simple and comparatively unexpensive Plan, which I have now suggested.

JOHN MARTIN.